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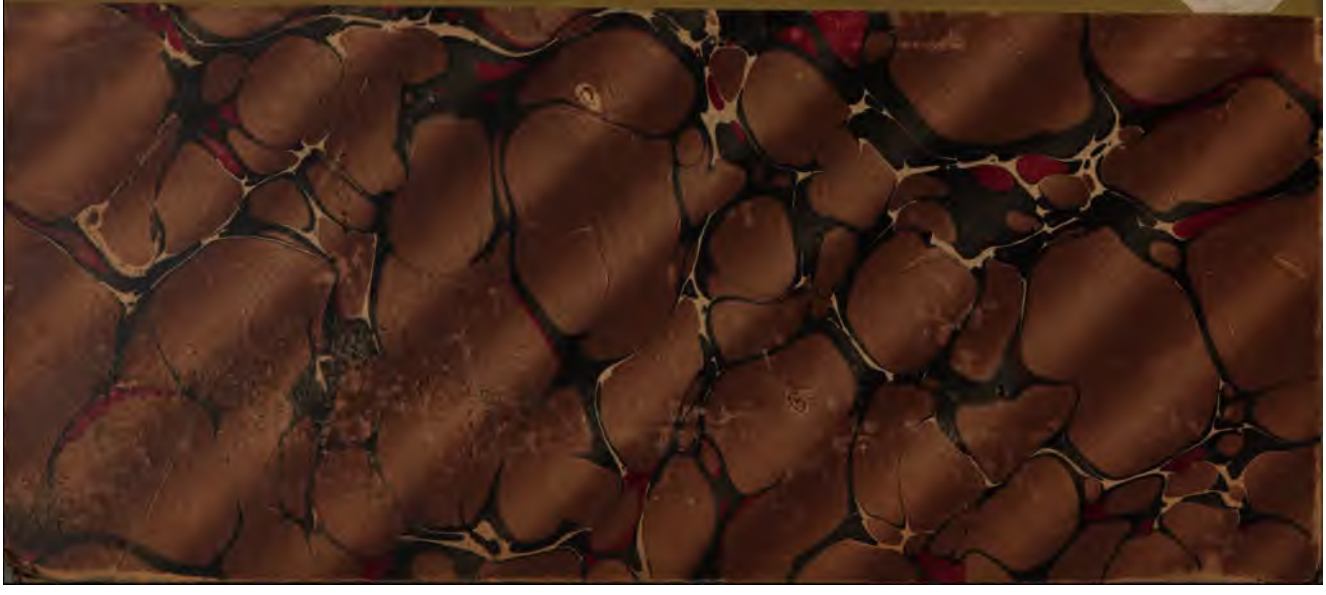

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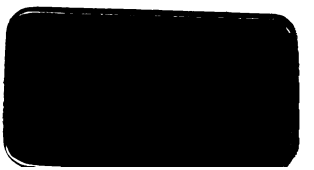

SHORTHAND

FOR

GENERAL USE.

BY

J. D. EVERETT, M.A., D.C.L.,

PROFESSOR OF NATURAL PHILOSOPHY IN THE QUEEN'S COLLEGE, BELFAST.

SECOND EDITION, REVISED.

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SHORTHAND.

PERSONS able to write shorthand form at present an extremely small portion of the community. This fact is surely an indication that existing systems have been found wanting in some of the qualities essential for general use.

Their main deficiency appears to me to consist in the want of sufficient facility for the insertion of vowels; these being expressed by signs which must be dotted in after the consonant outline is finished, so that the writer must go over his words twice, unless he is content to write them without vowels; in which case he must be prepared to face the difficulty of reading, which is usually found greater than that of writing.

In the most complete system hitherto published—I allude to the "Phonography" of Mr. Isaac Pitman—it is possible to write fast and at the same time legibly, but only by dint of an immense amount of memory-work.

The system here expounded furnishes the means of noting down the leading sounds of spoken discourse—both vowels and consonants—with a speed comparable to that which is attained in other systems by writing consonants only. The vowels are not dotted in after the consonant skeleton has been formed; but all sounds are written in the order in which they are spoken. There is consequently no difficulty in the fluent writing even of long and unfamiliar words.

Great attention has been paid to the important practical quality of *hardiness*. Every part of the system has been subjected to the ordeal of hurried writing; and many quasi-improvements, which would have produced an apparent shortening, have been rejected, for not working well when thus tested. It can be written freely, like longhand, and is scarcely, if at all, more liable than longhand to be rendered illegible by scribbling.

On these grounds, I claim for it that it is better adapted to general purposes than any other system hitherto published.

It is not burdened with a multitude of special symbols for individual words, the total number of these being only about a hundred; yet it has been able to hold its own, as regards speed and legibility, in competition with Mr. Pitman's system, in which such symbols are much more numerous.

At the annual examination of the Belfast Phonetic Shorthand Writers' Society, on the 18th of May, 1876, I was awarded a certificate for a hundred and sixty words a minute; a speed which exceeded by ten words a minute that of the fastest of my competitors, all of whom were writers of Mr. Pitman's system. Forty words a minute is about the utmost that can be attained in longhand.

The system is exhibited in detail in the lithographed pages ii. to xxi., of which pages vii. and ix. and the upper half of xi. will best convey to the merely critical reader a notion of its more characteristic features.

Pages xxiii. to xxxi. contain a specimen of writing in a style suitable for correspondence, making of extracts, and other purposes not requiring the highest rate of speed. The subject, Gawtress "On the Advantages of Shorthand," I have extracted from Harding's "Universal Stenography" (eleventh edition), with the omission of a paragraph in which secrecy is set forth as one of the "advantages." The same subject will be found (with the same omission) in Mr. Pitman's "Manual of Phonography," where it is given both in common type and in shorthand. Mr. Pitman also omits the concluding paragraph, which I have thought it desirable to retain, not only for its own sake, but as furnishing an example of the mode of dealing with short quotations from foreign languages, such as often occur in public speaking.

The next three subjects, extending from the beginning of page xxxiii. to the middle of page xli., are specimens of verbatim reporting, from my own notes. They are almost exact transcripts of the originals, except that the characters have been more carefully formed. The first two of them are from papers read (or rather spoken) in Section A of the British Association at its meeting at Glasgow in 1876. They show that the system is competent to deal with

technical terms and proper names, which, in other systems, are often great stumbling-blocks. The third is the conclusion of a sermon preached in Glasgow during the meeting of the Association. I have thought it better to suppress the name of the preacher, and also the names of the authors of the two papers, as no opportunity has been afforded to these gentlemen of revising the reports.

The concluding subject—an extract from a standard work on the glaciers of the Alps—is given as a specimen of compact writing. In following a speaker (unless he be excessively slow), it is not advisable to crowd the words very closely together; but for marginal notes and interlineations, compactness is often essential. The smallness which is practically attainable in writing any system is governed by the smallest characters of that system. Mr. Pitman's is very compact when the vowels are omitted; but when they are inserted, they require the consonants not to be written very small. In the present system, the consonants may be made as small as the pen can trace them, and the absence of vowel dots is a great relief to the eye in reading.

The following pages of letterpress (ending with page 26) are intended to be read as an accompaniment to the lithographed pages ii. to xli.

CONSONANT CHARACTERS. (*See page* ii.)

The consonant characters given in page ii. are all either straight lines or circular arcs. It is not optional (at least when the characters are joined) to begin at either end; but each character has a definite beginning and ending. Thus the character for *l* is begun at the lower and left-hand end and struck upwards; the character for *t* is begun at the left-hand end and struck from left to right; the character for *k* is begun at the top and struck downwards.

Every character is begun either at the left-hand end or at the top. As this rule would leave a doubt in the case of those strokes whose left-hand end is lowest, the words *up* and *down* have been inserted in the margin opposite all such strokes, to remove the ambiguity. *Up* indicates that the character is an upstroke, *down* that it is a downstroke. At the bottom of the page are three groups of joined characters, the order being the same as in the body of the plate, and there is a fourth group representing the other three superimposed.

When standing alone, the upstroke *l* and the downstroke *p* are distinguished by the difference of their slopes, *l* being inclined at about 30° and *p* at about 60° to the horizontal. The upstrokes *n* and *r* (when standing alone) are distinguished from the downstrokes *ng* and *h* by being light, while the latter are heavy.

The pairs of sounds *t* and *d*, *f* and *v*, *k* and *g*, *p* and *b*, *s* and *z*, *th* and *dh*, *sh* and *zh*, are natural pairs; the two members of each pair being alike, except in respect of one quality. This difference of quality is recognised by grammarians, and has received various names; perhaps the most appropriate name is the distinction of *light* and *heavy*. In each case the light sound is represented by a light and the heavy sound by a heavy stroke, without other difference. The character for *m* may be made either light or heavy.

W is a consonant in such words as *way, we, onward*, but is a vowel, forming part of a diphthong, in such words as *law, few, owl, own*. It is the consonantal sound that is represented by the character for *w* given in this page. This character is light. When thickened, it denotes *qu*, which is equivalent to *k-w*.

Y is a consonant in such words as *yet, young, beyond*, and is a vowel in such words as *by, buy, boy, say, prey*. The

character for *y* given in this plate stands for the consonantal sound. This character is light. When thickened, it denotes the same sound with the addition of the vowel sound *o͞o* (as in moon), the two together forming the compound which makes up the word *you* or the name of the letter *U*. With the exception of this compound sound, all the sounds represented by the characters in page ii. are consonants.

C has no special character, *c* hard being identical with *k*, and *c* soft with *s*.

CH when hard is identical with *k*. When soft, it is sounded *t-sh*, and is to be so written. The *t* may be omitted when no ambiguity is likely to arise from its omission.

J is sounded *d-zh*, and may be so written; but the sound of *zh* is so rare, except in this connection, that the *d* may always be omitted.

X has no special character. It is sounded *k-s*, and is to be so written.

VOWEL SOUNDS AND VOWEL CHARACTERS.

(*See page* iii.)

Vowel-sounds are not, in general, so sharply distinguished as consonant sounds, but in the mouths of different speakers, shade almost insensibly into one another; being much more affected than consonants by local and individual peculiarities, as well as by the tone of feeling which the speaker throws into his words.

Without pretending to represent every shade of vowel-sound employed in correct English speech, I claim a nearer approach to this end than has been attained by any system of shorthand hitherto published, not excepting the very beautiful system of Mr. Pitman. In one point I regard Mr. Pitman's analysis of the English vowel-sounds as defective, namely, in his omitting to note the distinction between the two powers of the letter *r*. This letter is a pure consonant whenever it begins a word, and also in such words as *parrot, merit, mirror, foreign, burrow;* while in the words *party, mercy, gird, fortify, burden,* it changes a light vowel-sound into a heavy one. The heavy vowel-sound contained in *gird* and in the first syllable of *mercy* is ignored in Mr. Pitman's system.

In the mouths of most Englishmen, no consonantal sound of *r* is pronounced in the five words last quoted, the *r* with its preceding vowel forming a diphthong, just as *w* forms a diphthong with *a* in *law*. We use the word diphthong in its popular sense of a vowel-sound represented by two letters. We do not mean to imply that the sound represented is compound.

When *r* ends a word, it always forms a diphthong with the preceding vowel, and this diphthong is followed or not followed by the consonantal sound of *r* according as the next word begins with a vowel or with a consonant (other than *r*).

The diphthong *ur* is only a diphthong as regards spelling. In pronunciation it is a simple sound, and one of the commonest sounds in the language. It is pronounced with less constraint of the organs of speech than any other vowel-sound, and is particularly easy to hold unchanged for a length of time. It ought, therefore, in phonetic writing, to be denoted by a single sign of its own, and not by a combination of two. The sign for the consonantal sound of *r* can be written after it when it occurs after it in speech, or when its latent presence is to be indicated (if the writer thinks this desirable).

The same sound is spelt in various other ways. Thus *firs* and *furs* are undistinguishable in ordinary pronunciation; so are *pearl* and *purl; fern* rhymes with *burn*, and *world* with *hurled*.

The diphthong *ar* is undistingnishable from the sound of *a* in *father*.

There are two distinct diphthongs represented (with or without the consonantal sound of *r* following them) by the combination *or*. One occurs in *lord, cord, horn, morning*, the other in *lore, gored, adorn, mourning*. The first of these, when not followed by the consonantal trill, is scarcely, if at all, distinguishable from *aw* or *au*, as in l*aw*, l*aud*, d*awn*, d*awn*ing. Ask an average Englishmen to write or spell *laud*, and he will understand you to mean *lord*. In Scottish pronunciation the difference between the two is very wide, because the consonantal trill is given.

The exigencies of verbatim reporting forbid the writing of any sounds which the writer does not require as aids to legibility; and I have endeavoured, throughout this book, to adopt those modes of spelling which to myself and the

majority of Englishmen are the most suggestive. But I do not wish to restrict my system of shorthand to any particular fashion of spelling. There is nothing, for example, to prevent the Scottish student from inserting the consonant *r* wherever he thinks it necessary, and if he desires a separate character for the aspirated *wh* (as in *white, where*), he can employ for this purpose the thickened character which I have assigned to *qu*. *Qu* can then be written *k-w*, and in fast writing *k* alone will usually suffice.

Page iii. contains the vowel-characters, all of which, except the last, consist of strokes similar to the consonant-characters, with a loop prefixed. The loop may be placed on either side of the stroke, and may be made either round or elongated, according to convenience, as shown in page vi., which exhibits every possible junction of a looped vowel with a preceding stroke. As regards those vowels which consist of a loop attached to a *curved* stroke (that is, all the vowels from *oy* to *ōō* inclusive), the curvature of the stroke may be reversed whenever convenient, the same general slope being preserved, as shown in the top line of page vi., which contains two alternative forms of each character. In a very few cases, it is convenient to put the loop on the convex side of the curve, as in the words *soil, boy*, page v., line 6.

The vowel-characters, like the consonant-characters, can be divided into *light* and *heavy*. The light characters, with the exception of the two upward-drawn characters *i, oy*, represent light (commonly called *short*) vowel-sounds; and the heavy characters, without exception, represent heavy (commonly called *long*) vowel-sounds. The names *long* and *short*, though established by usage, are not accurately descriptive; the *e* in *well*, though called short, occupies as much time in pronunciation as the so-called long *e* in *veal*.

Page v. contains a number of words written with the characters given in pages ii. and iii. The learner is recommended to translate these words into longhand or into speech, using the key to aid him if he finds it necessary; and then to write out a re-translation from the key into shorthand.

Shorter methods of writing most of these words will be indicated a little later; but until the learner is able to read these examples without reference to the key, he is not in a position for advancing further.

The table which occupies page vi. exhibits the best way of joining each of the looped vowels to a preceding consonant. The consonant-characters are placed for reference at the left hand of the table, and the vowel-characters at the top, two alternative forms of the latter being given in each case. All the combinations in any one horizontal line of the table begin with the same consonant, and all the combinations in any one vertical line end with the same vowel. No distinction is made between light and heavy strokes in this table, because the same mode of joining which is best for light strokes is also best for heavy. In those instances in which two selections are equally eligible, the resulting combination is given in both forms.

The skilful management of connecting loops is of great consequence, and is not very readily acquired by beginners. The learner is therefore recommended to make repeated copies of this table of joinings, with the view of habituating himself to those modes of introducing the vowel-characters which experience has shown to be the best, having regard both to speed and legibility. The time requisite for writing two strokes with a connecting loop is in most cases about the same as the time in which they could be written without it; but this is only true when the loop is properly managed, so as to carry the pen by a natural swing from one stroke to the other.

The vowel *ü*, which ends the list of vowel-characters, is identical with *yoo*, which has already been given among the consonant characters.

VOWEL MODES. (*See pages* vii. *and* ix.)

Pages vii. and ix. illustrate a second method of representing vowel-sounds—a method which, in the majority of cases, is preferable to the use of the vowel-characters given in page iii. The representation is effected by the mode of writing the letter preceding and the letter following the vowel to be expressed; hence I call these modes of representing vowels the *vowel-modes*, as distinguished from the *vowel-characters*.

In page vii. the letter preceding the vowel is supposed to be *k*, and the letter following the vowel to be *t*. A greater variety of illustration is given in page ix. The reference numbers in page ix. as far as 13, correspond to the reference numbers in page vii., each reference number being devoted to one of the 13 *vowel-modes*.

1. The first vowel-mode expresses *ī* or *ē* indifferently. It consists in increasing the size of the preceding character. Thus the characters for *b*, *h*, *m*, *s*, standing alone and written much larger than the normal size, represent *be, he, me, see*. If another consonant follows, it is joined to the enlarged letter without lifting the pen. I may here state that I only admit two sizes of letters, the normal size and the enlarged size. My experience has convinced me that a distinction of three sizes cannot practically be maintained in rapid writing. The particular size that shall be adopted as normal will depend upon the fineness of the pen or pencil point employed, the goodness of the light, the steadiness of the hand, and other accidental circumstances, but the general rule should be to keep the normal size as small as is consistent with distinctness, and to make the enlarged size about twice as large in linear dimensions.

2. The second vowel-mode expresses the sound *ā* (as in *mate*). It consists in writing the succeeding character above and to the right hand of the preceding one, a clear space being left between them, and the preceding character being of normal size. The succeeding character will also be of normal size, unless its enlargement is called for in order to express another vowel following it. Thus *gate* is expressed by the two characters which denote *g* and *t*, the second being written above and to the right hand of the first.

3. The third vowel-mode expresses the sound *ou* (as in *loud*). It consists in writing the succeeding character on a level with the preceding one, leaving a clear space between.

Thus the character for *t* followed by the character for *n* at the same level, with a space between, represents *town*.

4. The fourth vowel-mode expresses the sound of *a* in *father*, and consists in writing the succeeding character below and to the right hand of the preceding one, leaving a clear space between.

5. The fifth vowel-mode expresses *ĕ* (as in *met*). It consists in making the succeeding character spring from the middle of the preceding one. As it is difficult in fast writing to make the second character begin exactly upon the first, a very small space may be left, but not so large as in modes 2, 3, 4.

6. The sixth vowel-mode expresses *ă* (as in *cat*). It consists in making the succeeding character pass through, or only just clear of, the end of the preceding one.

7. The seventh vowel-mode expresses *ĭ* (as in *shine*), and may also be used for *oy* (as in *boy*). It consists in making the succeeding character cut through the preceding one.

8. The eighth vowel-mode, expressing the sound *aw* (as in *law*), consists in enlarging the preceding character, and in writing the succeeding character above and to the right hand of it, with a clear space between. This succeeding character is not to be enlarged unless for the purpose of expressing another vowel following it. The only difference between vowel-modes 2 and 8 is that in 2 the preceding character is normal-sized, and in 8 it is enlarged. The same remark applies to the comparison of 3 with 9, 4 with 10, 5 with 11, 6 with 12, and 7 with 13.

9. The ninth vowel-mode, expressing the vowel-sound which occurs in the word *fur*, consists in enlarging the preceding character, and in writing the succeeding one to the right hand of it on a level with its middle, with a clear space between.

10. The tenth vowel-mode, expressing *ŏ* (as in *go*), consists in enlarging the preceding character, and writing the succeeding one below and to the right hand of it.

11. The eleventh vowel-mode expressing *ŏ* (as in *mop*), consists in enlarging the preceding character, and in making the succeeding character spring approximately from the middle of its length.

12. The twelfth vowel-mode, expressing *ŭ* (as in *cut*), consists in enlarging the preceding character, and making the succeeding one pass through or just clear of its end.

13. The thirteenth vowel-mode, expressing either *o͞o* (as in *boot*), or *o͝o* (as in *foot*), consists in enlarging the preceding character, and making the succeeding one cut through it near its middle.

Page ix. contains a number of words written with the vowel-modes.

TWO VOWELS IN SUCCESSION. (*See page* xi.)

When two vowels occur together, it is impossible to express both of them by *mode*. If the first of the two be *ī* or *ē*, it is usually convenient to express this one by mode and the other by character. In general, it is more convenient to express the first by character and the second by mode.

The expression of the second vowel by mode requires no special provision in the case of modes 2–7; but mode 1 and modes 8–13 involve the enlargement of the preceding letter—that is, in the case we are now discussing, the enlargment of the first vowel—and this would lead to ambiguity when the enlarged vowel is *ī*, *ē*, *ā*, *o͞u*, or *ah*, unless some special provision were made; for enlarged *ī* would look like *īl*, enlarged *ē* would be identical with *ēd*, and so on. The upper part of page xii. shows the characters which are to be used as enlarged vowel-characters. It will be observed that when the normal-sized character consists of a straight stroke with a loop at the beginning, the corresponding enlarged character consists of a thin curved stroke of the same general slope, with a loop at the beginning. The loop is not enlarged. When the normal-sized character consists of a curved stroke with a loop at the beginning, the curved stroke is enlarged without other change, and the size of the loop is not altered. A light vowel-sound is never followed by another vowel, and the table shows the enlarged forms to be used for all the heavy vowel-sounds. The enlarged forms for *ī* and *oy* are identical; all the others are distinct.

Examples of words containing two consecutive vowels, one expressed by *character* and the other by *mode*, are given in the first seven lines of page xi. The first five lines do not call for any special remark. Line 6 consists of words in which the second of the two vowels is *ur*, and blends into one syllable with the first vowel. In this way are

formed the words *ire, ear, air, our, oar, your;* and the same collocations of sounds occur in a great number of other words. They are always to be expressed, when possible, by employing the ninth vowel-mode, as shewn in line 6 of page xi. But when one of these collocations of sounds concludes a word, it is no longer possible to employ the ninth mode. The only mode which is possible at the end of a word is the first, which expresses *ī* or *ē*. But the words which end in *ī* or *ē* preceded by another vowel are very few and rare (*snowy* and *clayey* are almost the only examples), while the words which end in the sounds *eer, are, ore,* &c., are exceedingly numerous. I therefore make it a rule that an enlarged vowel-character at the end of a word shall indicate not the addition of *ī* or *ē*, but the addition of *ur*, coalescing into one syllable with the vowel whose character is enlarged. Thus at the end of a word

enlarged *ī* denotes *ire*, as in *fire.*
„ *ē* „ *ere*, „ *mere, fear, peer.*
„ *ā* „ *are*, „ *fare, fair.*
„ *ou* „ *our*, „ *sour, power.*
„ *ō* „ *ore*, „ *lore, door, pour.*
„ *o͞o* „ *oor*, „ *poor, moor.*
„ *yoo* „ *ure*, „ *pure, your.*

This rule is exemplified by the words in line 7 of page xi.

The lower half of page xii. is devoted to double-consonants formed by adding the consonantal sound of *r* to another consonant. The characters for these double consonants differ from the ordinary consonant characters simply in having a hook at the beginning. Hence the *R* hook may be described as a hook *prefixed* to a consonant character to indicate the addition of *R after* the consonant sound. Lines 8–15 of page xi. contain words written with the *R* hook. When the hooked character is enlarged with a view to the expression of a following vowel by mode, the enlargement does not apply to the hook, which should always be kept as small as possible.

INITIAL CHARACTERS.

(*See page* xiii., *and top of page* xv.)

The option of putting the loop of a vowel on either side, and of bending the stroke (if curved) in either of two opposite ways, is not necessary, nor of much advantage, when the vowel begins a word. It is only when a vowel has to be joined to a preceding letter that such option is important. Advantage is taken of this circumstance to make several characters which, in the middle or at the end of a word, would denote vowels, take another meaning at the beginning of words. The characters given in page iii. have invariably the meanings there assigned them, but the duplicate forms not contained in that page, though given in page vi., are never to be used for vowels at the beginning of words. The meanings which these duplicate forms (or some of them) bear at the beginning of words are shown in the first column of page xiii.

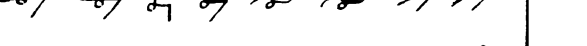
Again, special meanings are assigned to writing a word above or below the line. Writing a word above the line means that a loop is to be understood at the beginning of its first written character.

Writing a word below the line means that the sound *ă* is to be inserted before its first written character. Examples of these principles will be found in the first three lines of page xv.

No meaning is assigned to a character commencing with a loop unless written on the general level. Hence a word beginning with a loop is at once known to be on the line, and not above or below it. In writing on unruled paper, the vowel loop at the beginning of a word must sometimes be retained with this view.

The loops of the two prefixes *trans* and *circum* can never be omitted; the loops of the other prefixes are almost always omitted. It may be necessary here once more to state that each character has a definite beginning when joined to other letters. Thus the prefix *ex*, when written without the loop, is begun at the bottom and struck upwards, whereas the vowel *ŏŏ*, which resembles it in form, is begun at the top and struck downwards. The prefix *des* is struck downwards, and the vowel *oy* upwards.

EXAMPLES.

1.
2.
3. 
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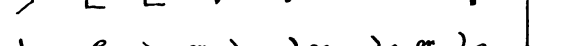
6. 
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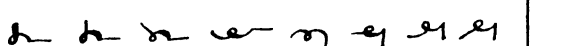
9. 
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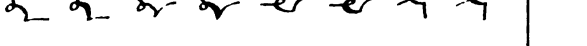
11. 
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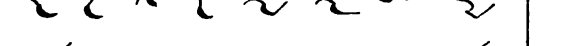
15. 

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draws out all the powers of the mind. It excites invention, improves the ingenuity, matures the judgment, and endows the retentive faculty with those superior advantages of precision, vigilance, and perseverance."

The facility it affords to the acquisition of learning ought to render it an indispensable branch in the education of youth. To be enabled to treasure up for future study the substance of lectures, sermons, &c., is an accomplishment attended with so many evident advantages that it stands in no need of recommendation. Nor is it a matter of small importance that, by this art, the youthful student is furnished with an easy means of making a number of valuable extracts in the moments of leisure, and of thus laying up a stock of knowledge for his future occasions. The pursuit of this art materially contributes to improve the student in the principles of grammar and composition. While studying the rules of abbreviation and connection, while tracing the various forms of expression by which the same sentiment can be conveyed, and while endeavouring to represent, by modes of contraction, the dependence of one word on another, he is insensibly initiated in the science of universal language, and particularly in the knowledge of his native tongue.

The rapidity with which it enables a person to commit his own thoughts to the safety of manuscript also renders it an object [peculiarly] worthy of regard. By this means a thousand ideas which daily strike us, and which are lost before we can record them in the usual way, may be snatched from destruction, and preserved till mature deliberation can ripen and perfect them.

In addition to these inestimable advantages, science and religion are indebted to this inestimable art for the preservation of many valuable lectures and sermons, which would otherwise have been irrecoverably lost. Among the latter may be instanced those of Whitfield, whose astonishing powers could move even infidelity itself, and extort admiration from a Chesterfield and a Hume;

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but whose name would have floated down the stream of time had not shorthand rescued a portion of his labours from oblivion. With so many vouchers for the truth of the remark, we can have no hesitation in stating it as our opinion, that, since the invention of printing, no cause has contributed more to the diffusion of knowledge and the progress of refinement—we might almost add, to the triumphs of liberty and the interests of religion—than the revival and improvement of this long-neglected and invaluable art.

Such are the blessings which shorthand, like a generous benefactor, bestows indiscriminately on the world at large. But it has additional and peculiar favours in store for those who are so far convinced of its utility as personally to engage in its pursuit. The advantages resulting from the exercise of this science are not, as is the case with many others, confined to a particular class of society; for, though it may seem more immediately calculated for those whose business it is to record the eloquence of public men and the proceedings of popular assemblies, yet it offers its assistance to persons of every rank and station in life—to the man of business as well as to the man of science—for the purpose of private convenience as well as of general information.

The motto of every young stenographer should be "persevere." The theory of the art may be speedily attained; but to acquire a practical proficiency in it, unremitting diligence and vigorous assiduity are requisite. Without these, genius will be of very little avail; for so much of the attainment is entirely mechanical, that practice, and nothing but practice, can impart and increase expedition. Neither this nor any other treatise can make a man a good stenographer without exertion on his own part. Let, then, those who value the purchase be willing to pay the price. "*Nil sine magno vita labore dedit mortalibus*" was the just maxim of the ancients; and every young person should remember that "he who will have no knowledge but that for which little exertion has been used must, one time or other, suffer the mortification of finding what he possesses to be of small intrinsic worth."

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ON THE INFLUENCE OF THE RESIDUAL GAS ON THE MOVEMENT OF THE RADIOMETER.

I have on the table before you some new forms of this instrument, which probably will almost explain themselves. I need not enter into any description of them, but I wish to bring before you some experiments, which I have recently made, which I think go far towards explaining the cause of the movements. In my first experiments I was inexperienced in the methods of getting vacuum to great perfection, and the inference was almost irresistible, that the better the vacuum the stronger the movement—that when I got up to the ultimate expression of a perfect vacuum I should get the strongest movement of all; and that opinion I think I stated. Subsequent experiments, however, showed me that that was not quite correct; and I have since been trying to ascertain experimentally whether a perfect vacuum would produce a stronger movement than ever, or would stop the movement altogether. I think I have succeeded in proving that a perfect vacuum entirely arrests the movement. I have also succeeded, I think, in the much more difficult task of measuring the exhaustion at those very high tensions which produce the strongest action, and also in measuring its different amounts in the different kinds of gas which I have experimented with. I will briefly describe the apparatus. The instrument that I have used for measuring and getting numerical results is not one of *these* instruments. These are mere toys; numerical results cannot be got from them. I have adopted an instrument, of which a sketch has been drawn

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here. This at the bottom is a piece of mica suspended by a torsion-fibre of glass. A mirror is suspended there which reflects a ray of light from a lamp on to a scale. Any angular movement of the piece of mica shows itself by a movement of the spot of light. By interposing a screen between the lamp and the mirror I can place a candle without action. When I remove the screen, I get angular deflection of the blackened surface, which I measure. By placing the screen in front, or blowing out the candle, I do away with all effect of radiation upon it. The apparatus is enclosed so as to be protected against radiation by glass screens. I can turn the apparatus through any angle I like. It is exhausted by a special Sprengel pump through a spiral of glass, so that I can move the instrument about without indian rubber joints. The reason of moving is that the ray of light goes out a certain distance along the screen, then the swing brings it back. By measuring the successive maximum deflections of a swing I get a logarithmic series, and I employ the logarithmic decrement to work with. If the decrease of amplitude is quick, the logarithmic decrement is large. The logarithmic decrement measures the viscosity of the gas. If there is absolutely no resistance to the movement, and the torsion-fibre is perfectly elastic, the logarithmic decrement will be zero, the swing would always keep up to the same rate, and we should get perpetual motion. That perpetual motion is like a perfect vacuum—it is unattainable; but I can get a very low logarithmic decrement, and I want to place this before you. As I exhaust, the logarithmic decrement diminishes, till I get the two columns of mercury at the same height. When I go on further exhausting, the logarithmic decrement goes on decreasing much more than the interval between initial and equal heights of columns. I have to magnify the scale for this part of the movement in order to express it. The logarithmic decrement

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scarcely alters till I get a nearly perfect vacuum, and then it diminishes more and more rapidly. The movement of the radiometer increases till I get beyond apparent equality of columns. My experiments stop short of a perfect vacuum. They were taken at very short intervals of pressure. The repulsion is very different in different gases. In some it commences very low down in the scale of exhaustion. This is the case with aqueous vapour. When any aqueous vapour is present I can get hardly any repulsion at all. Taking the unit as the millionth of an atmosphere, the best results in hydrogen would be obtained at about fifty units; in air thirty; in oxygen thirty.

FROM THE REPORT OF THE TIDAL COMMITTEE.

A large amount of work, in the reduction of the tides by harmonic analysis, has been performed, and is now about to be published.

Ten years' observations at Helbury Island, at [the] junction of [the] Mersey and Dee.

Two years' at Kurrachee, in addition to three already published.

Two years' at San Diego on the coast of California.

Three years' at West Hartlepool.

Two months' at Fort Leopold.

Four months' at Beechey Island in the Arctic Seas.

One year at Toulon, and one year at Brest.

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CONCLUSION OF A SERMON.

I can conceive someone meeting me and saying—"In all this you have only shown the capability for, but not the fact of, immortality;—possibilities in man of an existence in a world beyond the grave, if such a world there be; but you have not approached to any proof that such a world is, or that we shall ever see it." Yes, I answer, to him who has no faith in God that is all;—the cap[acity] of heaven, the possibility—the potentiality of it—a nature and capacities for it. Yes, that is all I can do; I have not shown the reality of it. For, without God, this world's course may be the thing of leprous waste and hideous incongruity which such a thought would involve. But if there be a God,—if there be indeed a Father of spirits, in whose image I and you were made, surely our reflection this afternoon justifies something more than a possibility—more than a faint hope of a hereafter, which may perchance prove after all a delusion. That he should have given us the capac[ity] of knowing and loving him—that he should have trained us, or seemed to train, to know and love him here, and made us at the same time feel that we are capable of knowledge and love hereafter,—can we see in that nothing to carry us beyond conjecture, nothing to dispel the darkness of the future, nothing to prove that our hope of immortality may not be all a mere idle dreaming? When I can believe that man is nobler and tenderer than God, and human affection more trustworthy than divine,—when I can think it possible for an earthly father to destroy the child that is just beginning to know and love him,—when I can think it possible for an earthly mother to look into the sweet eyes that are beginning

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to be lighted with the gleam of recognition and responsive love,—to listen to the sweet stammering lips that have just begun intelligibly to lisp the name—then dash the babe's life out,—then I will believe that the Father in heaven can destroy the spirits to whom he has given the intelligence to know and the heart to love him; then, but not till then, will I believe that he spake falsely who declared in those blessed words on which for the present and the future we may hang our deepest hopes:—"I give to them eternal life; and they shall never perish, neither shall any man pluck them out of my Father's hand."

CONCLUSION OF FORBES' "TRAVELS IN THE ALPS."

Poets and philosophers have delighted to compare the course of human life to that of a river. Perhaps a still apter simile might be found in the history of a glacier. Heaven-descended in its origin, it yet takes its mould and conformation from the hidden womb of the mountains which brought it forth. At first soft and ductile, it acquires a character and firmness of its own as an inevitable destiny urges it on its onward career. Jostled and constrained by the crosses and inequalities of its prescribed path, hedged in by impassable barriers which fix limits to its movements, it yields, groaning, to its fate, and still travels forward seamed with the scars of many a conflict with opposing obstacles. All this while, though wasting, it is renewed by an unseen power; it evaporates, but is not consumed. On its surface it bears the spoils which, during the progress of its existence, it has made its own; often weighty burdens devoid of beauty or value; at times precious masses sparkling with gems or with ore.

Having at length attained its greatest width and extension, commanding admiration by its beauty and power, waste predominates over supply; the vital springs begin to fail; it stoops into an attitude of decrepitude; it drops the burdens, one by one, which it had borne so proudly aloft; its dissolution is inevitable. But as it is resolved into its elements, it takes, all at once, a new and livelier and disembarrassed form; from the wreck of its members it arises another yet the same, a noble, full-bodied, arrowy stream, which leaps rejoicing over the obstacles which before had stayed its progress, and hastens through fertile valleys towards a freer existence, and a union in the ocean with the boundless and the infinite.

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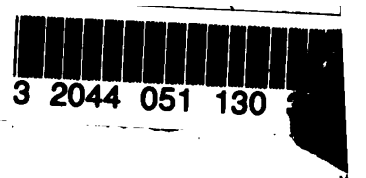

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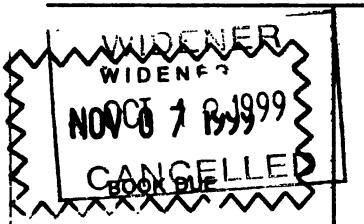

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